ACQUISITION OF SIGHT WORDS BY MENTALLY RETARDED CHILDREN: EFFECTS OF OVERCORRECTION AND EXTRA-STIMULUS PROMPTS

ELIZABETH MARGARET STRINGER

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ABSTRACT

Various methods have been used to teach sight words to young children. Typically, the word to be taught is paired with an extra-stimulus prompt such as a picture depicting the word, and the child is presented with the word and the picture and taught to read the word through trial and error. However, there is some evidence which suggests that the use of extra-stimulus prompts in sight word acquisition may be inimical to the child's learning. This proposition was tested in a series of three experiments. In Experiment 1, the efficacy of an overcorrection procedure in teaching sight words to moderately mentally retarded children was established. This procedure was then used as the basic technique of instruction in the following two experiments. In Experiment 2, the effects of word-picture, word alone and a control condition on sight word acquisition was tested in an alternating treatments design. A similar comparison was undertaken in Experiment 3, except that the word-picture condition was replaced by a word-object condition. The results showed that overcorrection is an effective instructional technique for sight word acquisition, and that extra-stimulus prompts may indeed hinder the child's learning. These results were explained in terms of an attentional model of learning.

GENERAL INTRODUCTION

Until recently, it was assumed that the capabilities of mentally retarded (MR) persons were very limited and that they were best cared for in large institutions separated from the main stream of society. However, it is now recognised that large institutions, which are costly to build and to run, are also unnecessarily restrictive for MR people and inhibit their enjoyment of their rights as citizens.

Given appropriate training and support, an increasing number of mentally retarded people can and are integrated into the community. The idea of community integration is part of a broader concept of normalisation. Nirje (1969) defines normalisation as making available to the mentally retarded, patterns and conditions of everyday life which are as close as possible to the norms and patterns of the mainstream of society. The concept of normalisation emphasises that what is provided by right, for other citizens, should be provided also for MR people.

A right for all citizens is the right to education (see Sleek, 1985). An important part of the right to education is the right to be able to learn to read. Reading is an important daily living skill for all people. Whether reading for pleasure or as part of a job, reading is an integral part of our lives. Today, when MR people are able to live independently within the community and when integration is becoming a reality in many schools, the need for these people to be able to read is greater than ever. Reading skills are not only necessary when competing for employment but are also useful for domestic and leisure-time activities such

as cooking, shopping, catching a bus, or reading the daily newspaper.

READING AND THE MENTALLY RETARDED

At the turn of the century reading was not considered to be a necessary or even a desirable skill for MR persons. Until the 1960's the educable mentally retarded (EMR or mildly mentally retarded) were being taught functional words such as street and convenience signs (e.g., men, women, toilet), cautionary words (e.g., stop, danger), and names of common objects. These words were usually taught by trial and error, repetition and drill within the classroom setting. Dunn in 1954 and again in 1963 stated that reading instruction for MR people had, on the whole, been neglected. One reason for this lack of research appears to be the minimal expectations set by educators, who held the conviction that teaching reading to the retarded was unrewarding and an unrealistic goal (e.g., Gunzburg, 1965).

Dunn (1954) found eleven studies showing MR persons to be reading below mental age expectation and only three studies showing their reading to be at the expected level. He concluded that MR children in special classes tended to read below their expected reading level. It seems that the label "mentally retarded" leads special education teachers to have very low expectations of the academic ability of such children.

Until the 1970's there was little research on the teaching of reading to trainable mentally retarded (TRM or moderately mentally retarded) children. The view most commonly held by professionals in the area was that the TMR

did not possess the mental abilities needed for academic skills such as reading and writing (e.g., Kirk & Johnson, 1951). However, a few encouraging views did appear in the literature (e.g., Cawley & Pappanikou, 1967) which made a reappraisal of old ideas necessary. A reassessment of the expectations of the TMR lead to the development of appropriate programmes for teaching them to read.

THE READING PROCESS

Although there is no one accepted definition of reading, most definitions emphasise recognition of the written word and the understanding of it's meaning. Chall (1967) has suggested that "the process of reading should be defined broadly to include as major goals not only word recognition but also comprehension and interpretation, appreciation, and application of what is read to the study of personal and social growth". Operationally, reading can be considered as consisting of two interrelated stages: word recognition and comprehension. The term, word recognition, is usually thought to describe the process of pronunciation of a written word and it is often assumed that some degree of meaning is also attached to the word. Comprehension is the understanding of what is read and can be achieved at different levels.

WORD RECOGNITION SKILLS

Methods of teaching word recognition skills to MR persons have been divided into four main categories: whole-word techniques, phonics, modified alphabets, and programmed instruction and automated techniques. The whole word approach has been the most popular approach in teaching MR people to

read (Singh & Singh, 1985). Typically a word is presented to the child by the teacher who then directs the child's attention to the word, says the word, and then gets the child to repeat it until the word is learned.

Errorless discrimination learning: Using a whole-word approach, complex discriminations (e.g., words) can be taught by a method known as errorless discrimination. This method includes using a simple discrimination which is gradually changed to a more complex one. For example, Terrace (1963), used this method successfully with pigeons to progressively decrease the difference between a discrimination of the orientation of a line.

Touchette (1968) sought to demonstrate whether a procedure designed to maintain stimulus control throughout training could be effective in teaching a discrimination task to severely retarded subjects who had already shown no learning under differential reinforcement conditions. Subjects with and without histories of trial-and-error learning were compared. Fourteen severely retarded boys were selected as subjects in the study. Their ages ranged from 9 to 16 years, and they had been institutionalised from 5 to 13 years.

During the preliminary training, the boys were taught to press whichever response key was illuminated. All children met the pretraining criterion of eight successive correct responses in fewer than 20 trials. Seven subjects were given criterion discrimination training and were rewarded for responses on the key closest to a square. One subject learned the criterion discrimination while six failed to learn. The six boys who had not learned under the

trial-and-error procedure were given a graduated stimulus sequence (a 60-trial instructional programme) to see if this would alter their performance. Five of the subjects made few or no errors.

Six boys who had received no trial-and-error training were presented with the programmed stimulus sequence and then the criterion discrimination test. The programmed sequence of graduated stimuli maintained almost perfect stimulus control and brought the boys under control of the last stimuli in only 60 trials. Both groups were tested for retention 35 days after the completion of training. Two boys in the trial-and-error group lost all that they learned while all subjects in the programmed group showed excellent retention.

Fading: Another discrimination technique, fading, has been used to teach sight words to mentally retarded children. The fading procedure requires the pairing of a new word with it's corresponding picture. For example, if the teacher is introducing the word car, a picture of a car is paired with the written word "car" as a prompt or cue. Once the relationship between the word and the picture has been established the child's attention is shifted to the word by the gradual fading out of the picture over a series of trials. Once the picture has been faded out the child's oral reading response should be controlled by the word alone.

In a series of three studies, Dorry compared a standard procedure of simultaneous presentation of picture and word to the fading technique. In the first study, Dorry and Zeaman (1973) chose eighteen MR children (IQ range of 23 to 55). The subjects were divided into two groups of nine children matched for MA and IQ. All the children were given

a pretest to see if they knew any of the target words. Any child that was able to recognise more than two words was not used in the study. The children were taught to recognise the pictures used in the study by a show-and-tell method until all the pictures could be correctly identified at least once. For the "faded" group the list of words and their corresponding pictures were presented one at a time. Over a series of three trials the pictures were gradually faded out so that on the fourth presentation of the list the pictures were barely visible. The words remained fully visible throughout the four presentations. The "non-faded" group received four presentations of the same list of words and pictures but the pictures remained at full intensity throughout the trials. A posttest consisting of one presentation of the test words was given immediately after the training session for both groups. Directly following the posttest a second list of words was presented to the children using the non-fading procedure and a posttest of this second word list was administered directly after the four training sessions. The authors found the fading procedure to be superior to the non-fading procedure for the first list of words. The group of children that had been given faded training learned more words from the second list as well.

A second study by Dorry and Zeaman (1975) used a sample of 36 retarded children who were non-readers. Nine children were assigned to each of four groups, matched for MA and IQ. All children were given a pretest to see if they knew any of the eight target words. Any child who knew more than one word was not used in the study. The children were also

taught the eight pictures using a show-and-tell method until each child was able to identify all of the pictures.

The faded group was trained by presenting a word and picture together on the first trial and on each of five subsequent training trials, the picture was gradually faded out but the words were not. The standard group had the same sequence, but no picture-fading. The mixed group had alternating trials of word-and-picture (unfaded) and word-alone and the control group received alternating trials of picture-alone followed by word-alone. On immediate and delayed tests, the faded condition showed the best results and the control condition the poorest results. Subjects in the mixed condition did not perform as well as those in the faded condition but did perform better than those in the standard condition.

In a final study by Dorry (1976), 48 mentally retarded non-readers were randomly assigned to four groups. The subjects were pretested to ensure that they were not able to read the target words. Any subject who knew more than one word was not used in the study. All subjects were pretrained to recognise the pictures until each picture could be identified. The four experimental conditions were: (1) Fade word in condition, the picture was fully visible on each training trial and the word was gradually faded in, becoming progressively more visible with each trial; (2) Fade picture out condition, reduced the visibility of the picture with each successive trial, while the word remained at full visibility on all trials; (3) Double fade condition combined the fading in of the word with the simultaneous fading out of the picture; and (4) Standard condition, the word and picture

were paired without fading on all training trials. Immediate and delayed tests showed that the fade picture out and double fade conditions were equally effective and superior to standard and fade word in conditions.

Walsh and Lamberts (1979) compared the Dorry and Zeaman (1973) picture fading procedure with an errorless discrimination technique using the Edmark Reading Programme. In this programme the word is initially presented alone. The subject is instructed to point to the word. The pointing response is shaped over a series of four to six exposures in which other words or word-like configurations appear with the target word. At first these are grossly dissimilar from the target word but gradually become increasingly similar to the target word.

Thirty moderately mentally retarded students participated in this study. The training procedures were alike in all respects except for the treatment differences that concerned the response task. On the day following the completion of instruction in each treatment, students were posttested on word-identification, word recognition, and picture-word matching tasks. The scores on the word-identification test obtained in the picture fading condition were considerably below those achieved under the errorless-discrimination approach.

McGee and McCoy (1981) compared the effectiveness of the Dorry and Zeaman (1973) fading technique to that of trial-and-error and delay procedures for teaching oral reading responses. The delay procedure is similar to the fading procedure but involves increasing the time intervals between word and picture presentations. Trial-and-error

training typically involves reinforcing correct responses to the written word while paying no attention to errors. In this study, during trial-and-error training, each word was presented alone for ten seconds or until a verbal response occurred and the picture was then superimposed on the word for ten seconds.

Four moderately mentally retarded males participated in this study. The experimental design was a multiple baseline across six sets of three words for each subject. Each set of words was trained with one of the three procedures: trial-and-error, fading, and delay. Differential effectiveness of the three training procedures was found, with fading and/or delay procedures producing greater acquisition and retention than trial-and-error techniques.

Pictures as prompts: Most of the studies using the whole-word approach to teach word recognition skills to mentally retarded persons have used picture prompts. These prompts have either been presented simultaneously (King & Muehl 1965), gradually faded over a series of trials (Dorry & Zeaman 1973; Dorry & Zeaman 1975), or their presentation has been gradually delayed over time (McGee & McCoy 1981). However, some researchers have questioned the usefulness of pictures as prompts. Samuels (1967), who noted that investigators rarely question the use of prompts or attempt to teach reading without the use of pictures, has suggested that pictures may in fact miscue and divert the child's attention from the written word. He uses attentional processes and the principle of least effort (Underwood, 1963) to explain why pictures interfere with the child's attempts at learning to read. The principle of least effort posits

that when a complex stimulus is presented to a child he will select that part of the total stimulus which most easily elicits the response. In the case of a child learning to read a word with a picture presented as a cue, it is usually the picture which elicits the correct response. Thus, instead of looking at the printed word the child attends only to the picture.

THE USE OF PROMPTS IN TEACHING READING

Samuels (1967) used 30 kindergarten children to evaluate the efficacy of teaching word recognition, with and without the use of pictures as word prompts. Ten subjects were randomly assigned to each of three experimental conditions: no-picture, simple-picture and complex-picture. For learning trials in the no-picture condition, each word was typed at the bottom of each card and no picture was present. In the simple-picture condition the word was typed at the bottom of each card and a simple black and white picture portraying the word was drawn above it. For the complex-picture condition, each word was typed at the bottom of the card and a colourful picture of a scene which depicted more than the target word was attached above. The cards used in the test trials had only the word typed on them with no pictures. Subjects were shown each card for four seconds then told the name of the word. A response was scored correct if the subject said the appropriate word before feedback was provided (after four seconds).

Samuels (1967) found that during the acquisition trials, when pictures were present, subjects in the picture-condition gave significantly more correct responses than did subjects

in the no-picture condition. On the test trials, when pictures were not available as cues the subjects in the no-picture condition gave significantly more correct responses than the subjects in the other two conditions. Samuels (1967) concluded that pictures function as distracting stimuli in that they draw attention away from the printed words.

In a second experiment, a story called "Fun at Blue Lake" was used to look at the effects of pictures on word acquisition skills. The story contained 106 words (50 different words) printed on the right hand pages of a book. For the picture condition a scene containing a lake, forest, cabin, and people was printed on the left-hand page. In the no-picture condition this page was blank. Fifty-two first-grade students participated in the study. The subjects were divided into two matched groups and assigned to the picture and the no-picture condition. Reading instruction was given to both groups simultaneously although the two groups of children were separated within the classroom. The instructional procedure was very similar to that given in a normal classroom setting and consisted of motivating and building background for the story, reading for a purpose, silent reading, and then oral reading. After the reading instruction the subjects were given a posttest. No pictures were available as cues during the posttest.

The results showed that for better readers the presence of pictures made no difference to word acquisition. The poorer readers, however, learned significantly more words in the no-picture condition. This supports the findings of Baker and Madell (1965) who also found that the performance

of less capable students was affected by distracting stimuli than was the performance of more capable students. In another study, Harris (1967) randomly assigned 240 kindergarten children to either a picture or a no-picture condition. In the no-picture condition the child was required to view a picture that represented the word and the word simultaneously, hear the word said, and then say the word. Experimental sessions were conducted individually with each child. Learning and test trials were alternated. Retention of the words was tested 24 hours after the laboratory session. During the test and retention trials the words were presented with no pictures. In comparing the two conditions, Harris (1967) found that subjects on the no-picture condition learned significantly faster on four of eight comparisons. Although statistically significant differences were not found in the other four comparisons, the data were in the predicted direction (that subjects would do better in the no-picture condition).

In a similar study, Ollila and Olson (1972) taught 75 kindergarten children four words using a word-picture, word-object, or word-alone method. During the word-alone method the child was shown the word cards one at a time. The investigator named the word and asked the child to repeat it. A posttest was given following this. During the word-picture method both picture and word were presented together while being identified by the examiner. Following this presentation, the picture was removed and the child asked to identify the word. The picture was used again when the response was incorrect. The same method was used in the word-object method as in the word-picture method except that

objects were used instead of pictures. The results were analysed separately for boys and girls because of possible examiner differences. The authors found that for girls it made little difference to word acquisition whether the words were presented alone or with a picture or object. With the boys, the method of presentation did make a significant difference to word acquisition, with the word-alone method producing the most rapid learning. Prior to the study, teachers were asked which technique would be the most efficient method of teaching the words. The word-object method was chosen unanimously. The results clearly indicated that this prediction was not supported.

Braun (1969) chose 240 kindergarten children to test the hypothesis that multi-sensory stimulation (pictures and words presented together) results in better learning than does single-sensory stimulation. Thirty low-ability boys and girls and thirty high-ability boys and girls were assigned to each treatment group. The auditory treatment involved presenting the written word, saying the word aloud, and then having the subject say the word aloud. Four words were taught and learning and testing sessions were alternated until all the words were mastered. The auditory-visual condition was the same as the auditory condition in every respect except that an illustration accompanied each word presentation. A retention test was given to the subjects 24 hours after the learning trials. Braun (1969) found that word learning was facilitated to a greater extent for boys using the no-picture method than was the case for the girls. In this study, however, all subjects (boys and girls) learnt the sight vocabulary significantly faster in the no-picture

condition than subjects in the picture condition.

Harzem, Lee, and Miles (1976) investigated the relationship between the nature of the picture and the printed word. Twenty children learned to read words presented as: (a) a picture of the object named by the word, (b) a picture of an object unrelated to the word, (c) a nonsense picture not resembling anything, or (d) with no picture. The least effective method was when the word was presented with the picture of the object that it represented. The most favourable outcome occurred when the word was presented without a picture of any kind. They concluded that whether learning is retarded by the presence of pictures or not would seem mainly to depend on the relationship between the picture and the printed word.

The studies discussed so far have shown that picture prompts hinder word acquisition. However, there are a number of studies which show pictures to have either no effect or enhance word acquisition.

PROMPTS AS AN AID TO TEACHING READING

Montare, Elman, and Cohen (1977) replicated the Samuels (1967) study. In Experiment 1 Montare et al. (1977) randomly assigned 10 kindergarten children to each of three experimental conditions: no-picture, simple-picture, and a complex-picture condition. The same materials and words used by Samuels (1967) were used in the study. Acquisition trials replicated those of Samuels but unfortunately Montare et al. misunderstood Samuels procedure of interspersing acquisition and test trials. They gave a test trial on an individual word immediately after the acquisition trial. In the standard

procedure, the subject has learning trials on all the words before receiving a test trial on all of them. The authors did, however, administer a further retention test which was administered to each child 20 minutes after the alternated acquisition and test trials. A t-test analyses of the test trial results of the study revealed no significant differences amongst the three groups on test trial performance. On the retention test trials the greatest amount of retention occurred in the no-picture group but there were no significant differences in retention performance amongst the three treatment conditions.

Montare et al. (1977) conducted a second study to replicate Samuels' (1967) classroom experiment. The authors used the same procedure as in the original experiment by Samuels but also included a third-grade population to obtain developmental data. No significant differences were found to exist between the picture and no-picture groups for children above or below the median reading level in the first or third-grade groups.

Kiraly and Furlong (1974) assessed the effectiveness of four object cues in teaching abstract and concrete words. The four cue conditions were: picture, word configuration, initial word sound, and geometric figure. Two groups of 40, high- and low-reading readiness kindergarten children participated in the study. The subjects were randomly assigned to one of the four treatment groups. There were 10 high- and 10 low-reading readiness children in each of the four treatment groups. In each of the four treatment groups, the children completed 10 learning trials and 10 test trials, with each learning trial being followed by a test trial. In

each learning trial the child saw a frame containing one of the four stimulus cues. In the second frame the stimulus cue was presented with its word and the child was told that learning the cue would help him to remember the word. In the third frame, the child was asked to decide which of three stimulus cues went with the printed word. The child was either prompted if he made an error or reinforced if he made a correct response. He was then asked to connect the cue to the word with a line. The fourth frame contained the stimulus cue and three words. The child was asked which of the three words went with the cue and was again either prompted or verbally reinforced and asked to underline the correct word. The fifth and final frame contained the word alone and the child was asked to say the word. During the test trial, each of the four words was presented without any stimulus cue.

The results indicated that words taught with picture cues were just as easily learned as words taught by configuration or by directing attention to the first letter cues. This study differed from previous studies (e.g., Braun 1969; Harris 1967; Samuels 1967) in that the child's attention was drawn to cue-word combinations during instruction. The authors suggested that if pictures and other cues are included in reading instruction and treated as incidental cues then Samuels (1967), and others, correctly suggest that it is not good practice to use cues in basic materials.

King and Muehl (1965) followed a procedure similar to that of Kiraly and Furlong (1974) in that attention was drawn to the printed word during instruction. The subjects were 210 kindergarten children (age range from 61 to 77 months). Twenty-one subjects were assigned to each of ten experimental

groups. Five groups of children read a common list of four similar words. The five different methods of training the subjects included the written word presented with either a picture, an auditory cue, a picture and an auditory cue, an auditory and an echoic response, and a picture, auditory and echoic response cues. The same methods of training were repeated with five dissimilar words. The picture groups were shown the word corresponding to the picture. After about two seconds the experimenter covered the picture and instructed the child to look carefully at the word. The children in the picture and auditory condition were also told the word in addition to seeing the picture. In the picture, auditory and echoic condition the child was also told the word and asked to repeat the word. When the method of training did not involve a picture the word alone was presented. The above training procedures were used for the echoic groups. King and Muehl (1969) found that pictures had neither a positive nor a negative effect on word recognition when the words to be learned were dissimilar but that pictures were an aid when the words to be learned were similar.

Hartley (1970) used six instructional methods to teach sight words to 127 first grade students. He used two word list types (minimal and maximal) combined with three cues (the word itself, a context cue, a picture cue). The minimal list contained words that were similar while the maximal list contained words that were dissimilar. The training sessions for the word only condition consisted of showing the subject a card with the word on it. The following directions were given: "This word is hen. Look at the word hen. Say the word hen". The training sessions for the picture cue

condition consisted of showing the subject a card with the picture and the word on it. The same instructions as in the word only condition were given. During the training sessions for the context (sentence) cue condition the subject was shown a card with a word on it. The subject was given the following instructions: "The hen is in the barnyard. Look at the word hen. Say the word hen". The test trials for both conditions were the same. The child was shown a card with a word on it and asked to read the word. In conflict with King and Meuhl's (1965) results, Hartley (1970) found that for dissimilar words, an oral sentence was the most effective cue (more so than picture or word alone). For lists of similar words, the word alone method was found to be superior.

The results of the studies reviewed produce no clear indication of the relationship between the use of prompts and word recognition skills. Arlin, Scott and Webster (1978) account for the inconsistent results in these studies as being due to basic flaws in experimental methodology. Their first criticism is that the medium of presentation and voice feedback have been confounded. In the picture prompt method the picture acts as a cue for the word, so minimal verbal feedback is required. In the word alone method much more verbal feedback is necessary because of the higher rate of errors. Montare et al. (1977), in a replication of Samuels' (1967: Expt. 1) study, provided verbal feedback to pupils who were unable to give the correct response to the word after a four-second presentation. They noted that the simultaneous presentation of the picture with word did not require much verbal feedback as the picture prompted the correct response. In the no-picture condition the word alone was insufficient to

prompt the correct response, so much more verbal feedback was necessary. Montare et al. (1977) found that the no-picture condition received 88% of the voice feedback.

The second criticism of Arlin et al. (1978) is that in these studies the temporal order of cueing is confounded with the picture/no-picture dimension. Usually the picture cue is presented simultaneously with the word to be learnt but in the word alone condition the verbal cue is provided after presentation of the word. Thus a facilitative (or distracting) effect may be present on presentation cueing but not on feedback cueing, regardless of picture or no-picture condition.

An experiment was conducted by Arlin et al. (1978) which attempted to control for these confounding variables. Seventy-two kindergarten children learned four words with or without pictures. Both picture cueing and voice cueing were presented simultaneously with the word prior to the pupil's response. Both were presented subsequently as feedback. Secondly, the voice feedback was given unconditionally in both the picture and no-picture condition. Voice feedback was given even if the acquisition response was correct to ensure equality of voice feedback. The authors reported that after controlling for confounding variables of temporal order of cueing, the simultaneous presentation of pictures with concrete sight words facilitates rather than hinders learning.

Ceprano (1981) compared a context method (words presented with pictures and/or in appropriate sentences) with an isolation method (the emphasis being on the distinctive letters, length and shape of the word) in teaching 158 beginning readers basic sight words. The methods were

equalised for instructional time. The children were taught five words per day, four days a week, for two weeks. On the fifth day of each week the children were tested using a sentence mode test and an isolation mode test. The results indicated an interaction between the method of teaching and the method of assessment. Children taught using the isolation method, performed better on the isolation test. Both groups performed equally well on the sentence test while the context group produced similar results on both measures. Ceprano (1981) suggested that isolation mode tests yield scores biased in favour of children taught by word alone techniques. A significant interaction between the method of instruction and the type of assessment used could account for some of the differences in the results of the research cited earlier.

THE USE OF PROMPTS IN TEACHING READING TO MENTALLY RETARDED CHILDREN

A number of authors have shown that the use of picture cues has a greater effect on slower learners (e.g., Samuels 1967; Baker & Madell 1965). This seems to be in agreement with the data on over-selectivity in autistic and mentally retarded children. Wilhelm and Lovaas (1976) refer to the phenomenon of responding to only a few cues out of a large range of available cues as "stimulus over-selectivity" or over-selective attention. Initially, stimulus over-selectivity was thought to occur with stimuli of different sense modalities such as visual, auditory, or tactile but more recent studies have shown that autistic children over-select when the cues fall within the same sense modality (see for example, Reynolds, Newsom & Lovaas 1974). The

mentally retarded child may have difficulty with prompts since he may attend only to the prompt and not the training stimulus.

Stimulus over-selectivity is pertinent to the use of pictures as cues in word acquisition training. Wilhelm and Lovaas (1976) taught three groups of children with different IQ levels (severely, moderately, non-retarded) to discriminate between cards containing two or more pictures. Two cards, containing three different pictures each, were labelled as training cards. Half of the children were taught to respond to one of the cards and the other half were taught to respond to the other card. The discrimination was taught by initial prompting and reinforcement for correct responses. During the posttest the subject had to respond to all six pictures individually.

The authors found that the children in the non-retarded group responded to all three cues, while children in the severely retarded group responded to an average of 1.6 cues, and children in the moderately retarded group responded to an average of 2.1 cues. This finding would suggest a relationship between intelligence level and the number of cues utilised in the task. This finding is in agreement with that of Samuels (1967) who found that the use of picture cues was less effective for slower (and presumably less able) readers.

Wolfe and Cuvo (1978) addressed the problem of whether within-stimulus prompting is a more effective instructional technique than extra-stimulus prompting for mentally retarded children. Twenty-four institutionalised severely mentally retarded persons (19 males, 5 females) participated in the

study. Each subject received training in both extra-stimulus and within-stimulus prompting. Six target letters were chosen. In the within-stimulus prompting condition the critical features of the letters (e.g. H-N; horizontal-slant; C-O; open-closed) were thickened or highlighted. During the extra-stimulus prompting condition a finger pointing prompt was used. The pretest consisted of presenting three randomly selected letters on each trial. The experimenter asked the subject to point to a randomly selected letter. This procedure was repeated until all the cards had been tested four times each in a random order. This recognition test also served as a post- and follow-up test.

For both prompting conditions, the experimenter placed three cards in front of the subject. The three cards consisted of the target letter and two distracter letters. The distracter letters remained constant for each target letter throughout the experiment. Each letter was trained to criterion before another set of three cards were presented. During the training phase in the within-stimulus prompt condition, the target letters were initially presented at full prompt level (highlighted critical features such as top and bottom curves of the 'c'). In the extra-stimulus prompt condition, a full finger pointing prompt was used. As the subject progressed through the training sessions the critical features of the letter in the within-stimulus prompting condition were decreased while in the extra stimulus condition the experimenter successively moved her finger higher above the stimulus card. This continued until the letter had been learned. The results showed that a signif-

stimulus prompt condition were acquired and retained over a two-week period than those trained by the extra-stimulus prompt condition. The within-stimulus prompt condition also required fewer trials and less time to learn the letters than the extra-stimulus prompt condition.

Smeets, Lancioni and Hoogeveen (1984) assessed the effect of four stimulus manipulations on the acquisition of word discriminations by seven mentally retarded children (IQ 40-62). All subjects were trained using the four training conditions. In two of the conditions (stimulus shaping and stimulus-connected prompt fading), the stimulus manipulations were designed to guide the subjects' attention to the printed words. This was done by changing the shape or eliminating part of the prompts. The prompts were presented very near or directly connected to the printed word. In the other two conditions, the prompts were spatially separated from the words and were either faded or presented at full intensity. On each trial the experimenter showed the subject a card and asked, "What is this?" If the subject gave the correct response reinforcement was given but if he made an incorrect response the experimenter provided corrective feedback.

The results indicated the stimulus shaping and stimulis-connected prompt fading were successful in establishing word recognition. The efficacy of the picture prompts was found to be limited when the subjects were allowed to respond to increasingly difficult prompts without having their attention guided to the training stimulus. They also found the efficacy of the pictorial prompts to be uniformly low when no fading was used. The authors concluded that external cues

such as pictures can be used effectively by retarded children for establishing word discriminations as long as they guide their attention to the training stimulus.

It is clear from this research review that the data available on how mentally retarded children learn basic sight words are severely limited. This lack of research has meant that mentally retarded children have been taught basic sight words with the same methods as children of 'average' intelligence. This usually involves frequent use of prompts such as pictures and objects. However, it is clear that the efficacy of such prompts with mentally retarded children still needs to be established.

THE EXPERIMENTS

Three experiments were conducted. Although each experiment is complete in itself, the thesis is best seen as consisting of a series of related experiments. In each of the three experiments the teaching technique overcorrection was used to teach a list of basic sight words. Experiment 1 was designed to evaluate the overcorrection procedure using a multiple baseline across subjects design. Experiments 2 and 3 were designed to evaluate the effects of extra-stimulus prompts on word recognition skills. Extra-stimulus prompts have traditionally been used in teaching basic sight words. The prompt used in Experiment 2 was a picture depicting the word to be learned while in Experiment 3 the prompt was an object of the word.

Experiments 2 and 3 utilised an alternating treatments design (Barlow & Hayes 1979). Within an alternating treatments design, each treatment is systematically varied and all

other stimulus conditions counterbalanced within the same phase. The frequent alternation of treatments minimises time correlated artefacts that may occur when two or more treatments are tested serially. This design permits a direct comparison of two or more interventions with each subject so that the course of learning of each subject under different conditions can be determined.

Thus, in Experiment 1 the efficacy of an over-correction procedure as a teaching technique was established. Experiment 2 was designed to compare the effects of word-picture, word-alone, and a no-training control condition in teaching basic sight words. Experiment 3 compared the effects of word-object, word-alone and a no-training control condition in teaching a basic word vocabulary. Both Experiments 2 and 3 were designed to test the assumption that extra-stimulus prompts enhance learning of sight words by moderately mentally retarded children.

EXPERIMENT 1

ACQUISITION OF SIGHT WORDS USING OVERCORRECTION

Overcorrection is a practical and socially acceptable behavioural technique for producing behaviour in both child and adult populations. The procedure often produces a rapid and enduring change in behaviour (Foxx 1976; Foxx & Bechtel 1982). The general rationale of the overcorrection procedure is, first, to get the individual to overcorrect the effects of an environmental act. This may involve getting a child to make five beds completely and dust the bedrooms if he has pulled his bed apart. The second part of the overcorrection procedure, positive practice, is designed to teach the appropriate behaviour. When no disruption has occurred, only the positive practice aspect of the procedure is used. Overcorrection is a more humane and realistic way of treating many behaviours than other behavioural methods. It is educative in that opportunities are provided for individuals to learn a correct response rather than merely receive punishment for incorrect responses.

Overcorrection has been used to successfully motivate retarded individuals to cease wetting and soiling their clothing (Foxx & Azrin 1973a), self-stimulating (Foxx & Azrin 1973b), aggressing towards peers and objects (Foxx & Azrin 1972), and to eliminate public disrobing (Foxx 1976). Educators have used the positive practice aspect of the overcorrection procedure to successfully teach academic skills with both children of average intelligence (Foxx & Jones 1978) and mentally retarded children (Matson,

Esveldt-Dawson & Kazdin 1982). An overcorrection procedure would seem particularly useful when teaching the mentally retarded student who learns slowly and only after repeated demonstrations and practice of a skill (Singh 1985).

Foxx and Jones (1978) evaluated four procedures designed to help poor spellers improve their spelling. Twenty-nine students (24 boys and 5 girls) were selected from an elementary-junior high school to participate in the study. The baseline phase required the teacher to teach the weekly spelling lesson as she usually did. Traditionally, 20 words were provided on Monday. The words were learned by various practice exercises each day and a weekly spelling test was given on Friday. Following baseline, four experimental conditions were implemented with all subjects, with each condition being in effect for four weeks. At the beginning of each experimental condition the teacher described the experimental procedure to the students. The four experimental conditions were: (1) The Pretest/Test condition -- the students were given a pretest and the weekly spelling test was given on Friday. (2) Test/Positive Practice condition -- In this condition, the students were given their weekly spelling test on Friday and the graded papers were returned to the students on the following Monday. Using a positive practice procedure the students were required to write out, for each incorrectly spelt word, its correct spelling, correct phonetic spelling, part of speech, complete dictionary definition, and correct usage in five sentences other than the examples cited in the dictionary or spelling book.
(3) Pretest/Positive Practice/Test condition -- In this condition, the students were given a pretest on Wednesday.

The papers were returned to the students on Thursday and each student was required to write out each incorrectly spelt word using the positive practice procedure as in (3) above. The students were given the weekly spelling test on Friday. (4) Pretest/Positive Practice/Test/Positive Practice condition -- This condition followed the same procedure as the previous condition with the addition of a positive practice requirement for words misspelt on the Friday test.

The results indicated that the three conditions which used the positive practice procedure produced the largest increase in spelling accuracy and the Pretest/Positive Practice/Test/Positive Practice condition led to the greatest increase.

Ollendick, Matson, Esveldt-Dawson and Shapiro (1980) compared the efficacy of a positive practice plus reinforcement condition against a positive practice alone condition, a no-remediation control condition, a traditional corrective procedure plus positive reinforcement, and a traditional procedure used to teach spelling. Two children (a 10-year-old male; 8-year-old female) participated in Experiment 1. Both children had been hospitalised for extreme aggressive behaviour and failure to progress in school. Three sets of five words were chosen and one list was randomly assigned to each remediation condition. The three experimental conditions were: (1) Positive Practice. The child was required to listen to the word pronounced by the teacher, pronounce the word correctly, say aloud each letter of the word and write the word correctly. This was repeated five times for each misspelt word. (2) Positive Practice plus Positive

Reinforcement. The positive practice procedure was followed for each misspelt word and the teacher placed a 'star' beside each correctly spelt word and praised the child. (3) No-Remediation Control. The children were instructed to spell the words. No feedback as to the accuracy of their performance was provided. With both children, the two positive practice conditions were superior to the no-remediation control condition. Positive practice plus positive reinforcement resulted in more rapid learning for both children than positive practice alone.

In Experiment 2, positive practice plus positive reinforcement was compared to a more traditional teaching procedure and a traditional teaching procedure plus positive reinforcement. As in Experiment 1 an alternating treatments design was utilised. Two children (a 12-year-old male, a 13-year-old female) participated in the study. Both were hospitalised for aggressive behaviour. One set of eight words was randomly assigned to each of the three experimental conditions. For the positive practice plus positive reinforcement condition the same procedure as described in Experiment 1 was utilised. In the traditional condition the teacher marked each incorrectly spelt word with a cross and wrote the correct spelling beside the word. During the traditional teaching plus positive reinforcement condition the same procedure was used but with the addition of a star placed beside each correctly spelt word.

The results showed that positive practice plus positive reinforcement was superior to the other two conditions. The authors concluded that the results of both studies indicate that an academic remediation procedure consisting

of positive practice for incorrectly spelt words and positive reinforcement for correctly spelt words produces the greatest gains in spelling performance.

Matson, Esveldt-Dawson, and Kazdin (1982) investigated the effects of positive practice alone and in combination with reinforcement in enhancing correct spelling in three mentally retarded children (one mild and two borderline retarded). All three children were hospitalised in a psychiatric facility. The stimulus material consisted of 15 words randomly assigned to three sets of five words each. Each of the three word sets were randomly assigned to one of three experimental conditions: (1) Overcorrection. In this condition the teacher pronounced the word, the child spelt the word, the teacher pronounced the next word if the previous word was spelt correctly; or, if the child made an error, he was required to spell the word correctly and write it down five times, saying each letter of the word as it is written. (2) Overcorrection plus Reinforcement. This involved the above overcorrection procedure for incorrectly spelt words. The teacher placed a coloured sticker beside correctly spelt words and praised the child's performance. (3) No Treatment Control. During this condition, the children were asked to spell the words and no feedback for word accuracy or positive reinforcement was provided.

A combined alternating treatments and multiple baseline design was used in this study. The results indicated that overcorrection plus positive reinforcement produced rapid reduction in misspelt words when introduced to different word sets at different points in time for all subjects.

Recently, Stewart and Singh (in press) used an over-correction procedure plus positive reinforcement to teach four mentally retarded children (two girls and two boys) to spell a list of words. A multiple baseline across subjects design was utilised. During training, the teacher pronounced the target word and the child wrote down the word, saying each letter aloud as it was written down. If the word was spelt incorrectly the teacher pronounced the word again, the subject pronounced the word, the teacher said aloud each letter of the word, and the subject said aloud each letter of the word as he or she wrote the word correctly. This sequence was repeated five times. Overcorrection was effective in increasing the spelling achievement of all four children. The study also provided data showing long-term maintenance of training gains over a period of six months.

The overcorrection procedure has also been used in teaching other academic skills to mentally retarded children. These include teaching sign language and oral reading skills. In a recent study, Linton and Singh (1984) investigated the effects of positive practice alone and in combination with reinforcement. The authors investigated the effects of the training procedures on the acquisition of sign language by four mentally retarded persons. An alternating treatments design was used. During the overcorrection condition, an error in signing resulted in the subject having to repeat the correct response five times. In the combined condition, the overcorrection procedure was used for incorrect signing and each correct response resulted in positive reinforcement. No assistance or feedback was given during the no-training control condition. The study demonstrated the effectiveness

of both positive practice alone and positive practice plus positive reinforcement conditions in teaching sign language to mentally retarded individuals. With three of the subjects, positive practice plus positive reinforcement was superior and with the fourth, both training procedures were equally effective.

Singh, Singh and Winton (1984) evaluated the differential effects of positive practice overcorrection alone or combined with positive reinforcement and a no-treatment control condition on oral reading errors and self-corrections of errors by four moderately mentally retarded girls. The positive practice alone condition involved each incorrectly read word to be repeated five times and the sentence in which the word occurred to be correctly repeated once. During the positive practice plus positive reinforcement condition the positive practice procedure was applied to each incorrectly read word, and, in addition, each self-corrected error was reinforced. No assistance was provided in the no-treatment control condition.

The results were consistent with other studies showing that the overcorrection procedure was an effective teaching technique. There was a decrease in oral reading errors and an increase in self-corrections in all four subjects. Combining the procedure with positive reinforcement for self-corrections proved even more effective. In a more recent study, Singh and Singh (in press) have shown overcorrection to be superior than a drill procedure in increasing the reading proficiency of mentally retarded children.

In light of the research in these areas it would seem likely that an overcorrection procedure would be effective in

enhancing the word recognition skills of mentally retarded children. Thus Experiment 1 was undertaken to establish the efficacy of overcorrection in enhancing the word recognition skills of four moderately retarded children.

METHOD

Subjects and Setting

Four children from a special school for mentally retarded children participated in this study. Two subjects (Wendy, Natasha) had Down's Syndrome but the etiology of the other two (Justine, Thaddeus) was not known. None of the children suffered from epilepsy or were on medication during the course of the study. Two of the children were moderately retarded (Justine, Wendy) on the AAMD criteria (Grossman, 1983). Natasha was severely retarded and Thaddeus was mildly retarded. Further research about the children is presented in Table 1. The research was conducted in a quiet corner of the children's regular classroom. The children's usual

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Insert Table 1 Here

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classroom activities were carried out except that no instruction was provided in word recognition skills during the course of this study.

Stimulus Materials

Ten words were used in this study. These were names of objects in the children's classroom. Each word was printed

TABLE 1

Characteristics of the Subjects

Subject	Age (years)	Standford-Binet IQ	PPVT[a] (age equivalent in years)
Wendy	9	45	3.0
Natasha	9	32	2.11
Thaddeus	6	57	2.9
Justine	10	47	5.5

[a] Peabody Picture Vocabulary Test

in lower case, black letters (5cm high), on a 10cm by 15cm white card. The cards were covered in clear plastic to avoid marking due to frequent handling by the children. The words were: icecream, water, soap, hands, toothbrush, cake, shoes, mirror, pencil, and jigsaw.

Response Definitions

Two mutually exclusive responses were recorded: oral reading errors and correct responses to the word. An error was defined as any mismatch between the word and an oral response to that word, including mispronunciations. A response was also recorded as correct if the child accurately corrected an error without assistance from the experimenter. Only the first attempt at self-correction was taken as a correct response and the self-correction had to be made before the experimenter moved on to the next word.

Data Collection and Reliability

All sessions throughout the study were audiotaped so that responses could be rated to assess rater reliability. An independent rater also observed 20% of the experimental sessions to check that the experimenter correctly implemented the experimental procedures. The experimenter was observed to be following the correct procedures during all such sessions.

The experimenter was a trained teacher with some expertise in behavioural methodology. She was given additional training in behavioural observation, recording, and the experimental procedures used in the present study. Baseline recording began only after inter-rater agreement between the experimenter and an independent rater was 95%

or more on three consecutive sessions. For each child, 25% of the audiotaped experimental sessions were randomly selected and scored by an independent rater for inter-rater reliability checks. Inter-rater reliability, computed using a word-by-word analysis (Kazdin 1982) ranged from 95% to 100%, with an average agreement of 98.5% between the two raters.

Procedure

A multiple baseline across subjects design (Kazdin 1982) was used to evaluate the effects of an overcorrection procedure on learning basic sight words. Each daily training session lasted no longer than 10 minutes.

Baseline During baseline sessions each child was shown a list of ten words, one word at a time. At the beginning of the session, the child was told: "I'm going to show you some cards with words on them and I want you to read each word as I show them to you." The experimenter placed each card in front of the child and said: "Point to the word. What is that word?" The experimenter provided feedback as to the accuracy of the child's answer but all requests for help with difficult words were ignored.

Intervention During this phase an overcorrection procedure was initiated with each child in succession. Overcorrection involved asking the child to repeat each incorrectly read word five times. As in the baseline condition, the child was told at the beginning of each session: "I am going to show you some cards that have words printed on them, and I want you to read each word as I show them to you". For each word, the experimenter requested the

child: "Point to the word. What is that word?" If the child made a correct response the experimenter provided descriptive praise, saying "Good. That word is ..." If the child made an incorrect response the experimenter told the child the correct response and asked the subject to point to the word and repeat it correctly. She said: "No. That word is ... Now point to the word and say it correctly five times".

Posttest At the conclusion of each training session, each child was tested on all 10 words under baseline conditions.

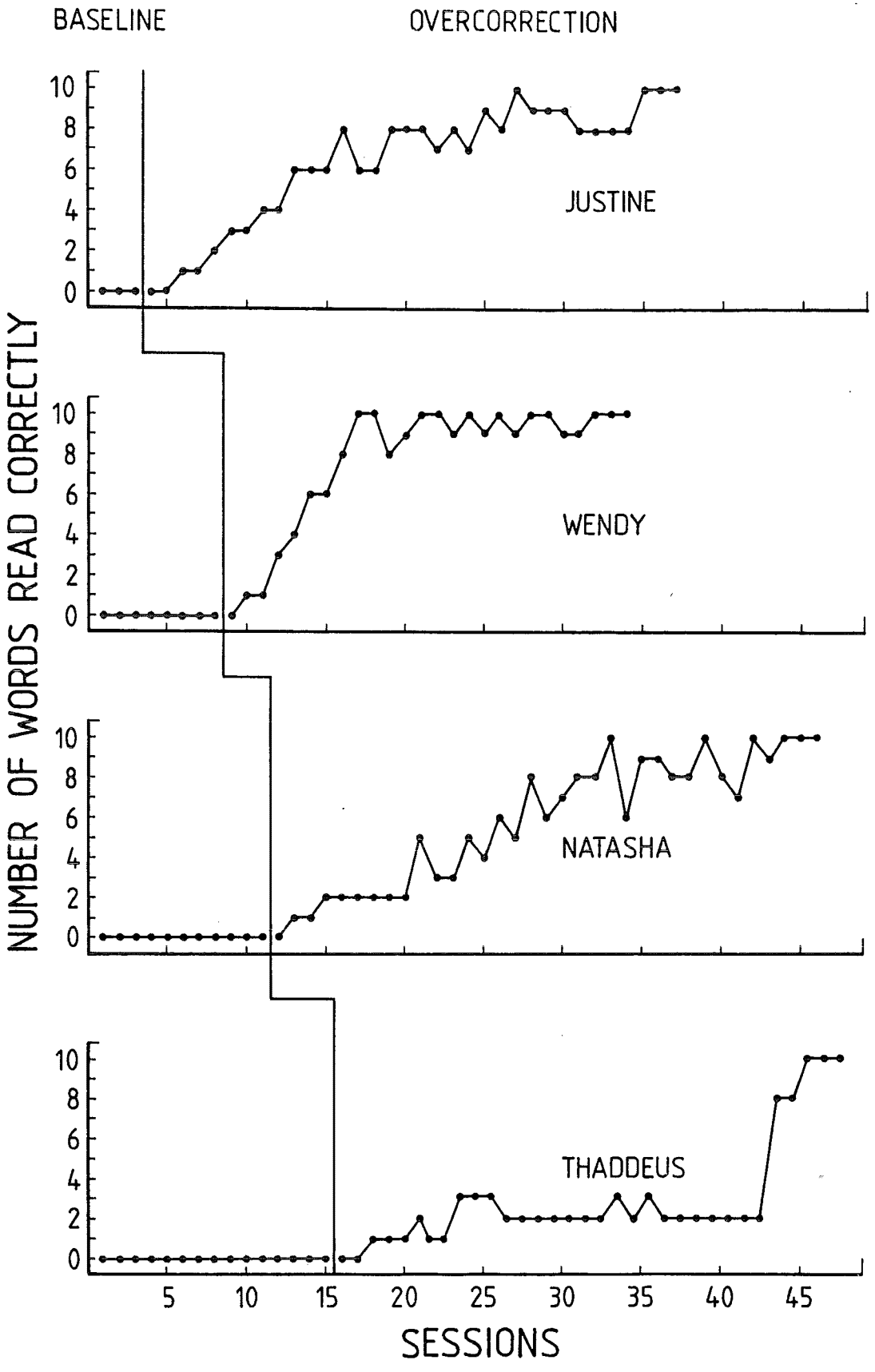
RESULTS

The number of words read correctly by all subjects during both the baseline and overcorrection phases are shown in Figure 1. Data points are for each session during both the baseline and overcorrection phases. The data points during the overcorrection phase are taken from the posttest.

Insert Figure 1 Here

No words were read correctly by any of the subjects during baseline. The overcorrection procedure, once initiated, greatly enhanced word recognition with all subjects rapidly learning the word list.

FIGURE 1. Number of correct responses for Justine, Wendy, Natasha, and Thaddeus across all experimental conditions. No training contingencies were in effect for the words during baseline.


BASELINE
OVERCORRECTION
JUSTINE
WENDY
NATASHA
THADDEUS
NUMBER OF WORDS READ CORRECTLY
SESSIONS
0
2
4
6
8
10
5
10
15
20
25
30
35
40
45

DISCUSSION

The results of Experiment 1 demonstrate the efficacy of an overcorrection procedure in teaching basic sight words to a group of moderately mentally retarded children. The results support the findings of Foxx and Jones (1978) who found overcorrection procedures to increase correct spelling in a group of elementary-junior high school students. The findings of this study are also consistent with those of Ollendick et al. (1980) who found an overcorrection procedure to be superior to a no-remediation control condition and a traditional teaching procedure in increasing correct spelling in four institutionalised children. More recent studies, involving mentally retarded children, have also shown overcorrection procedures to enhance academic skills such as increasing correct spelling (Matson et al. 1982; Stewart & Singh, in press), decreasing oral reading errors (Singh & Singh, in press; Singh, Singh, & Winton 1984) and teaching sign language to nonverbal individuals (Linton & Singh 1984).

The results of the present study not only show the overcorrection procedure to be an effective teaching technique but also show the procedure to be effective in producing rapid learning. A number of studies involving mentally retarded individuals have shown the effects of various overcorrection procedures to be both rapid and durable in changing behaviour (e.g., Foxx & Azrin 1973a; Foxx 1976).

Overcorrection is a suitable teaching technique to use when working with mentally retarded persons since they typically need repeated demonstrations and practice of a skill

before learning occurs. Overcorrection is also suitable for classroom use since it does not disrupt classroom routine, and it can be easily taught and administered by teachers (Foxx & Jones 1978). Finally the procedure requires little teacher time; a ten-minute teaching session with each child was all that was required each day during this study.

EXPERIMENT 2

EFFECTS OF EXTRA-STIMULUS PROMPTS: PICTURES VS NO-PICTURES

Children are usually taught to read using extra-stimulus prompts such as pictures and flashcards (Kiraly & Furlong 1974; Samuels 1967) or real objects (Ollila & Olson 1972). While the data are mixed, the existing evidence indicates that with normal children at least, word recognition may actually be disrupted when extra-stimulus prompts such as pictures are used (Braun 1969; Harris 1967; Samuels 1967). Only limited research has been undertaken with mentally retarded children investigating the effects of extra-stimulus prompts on word recognition (Smeets, Lancioni, & Hoogeven 1984). Thus, Experiment 2 was designed to investigate the effects of pictures and no pictures on the word recognition skills of four moderately mentally retarded children.

In this study, an alternating treatments design was utilised (Barlow & Hayes 1979; Kazdin & Hartman 1978). In an alternating treatments design, each treatment is systematically varied and all other variables are counterbalanced across stimulus conditions within the same phase. Also, the frequent alternation minimises time-correlated artifacts which may occur when two or more treatments are tested serially as in reversal or multiple baseline designs. The experimental phase is terminated when one of the experimental conditions reaches a pre-set criterion and the more or most effective treatment is used in the final phase to demonstrate clinical control.

In Experiment 1, it was found that moderately mentally retarded children could rapidly learn sight words using an overcorrection procedure. In Experiment 2, the same overcorrection procedure was used to teach sight words under two different conditions. In one, overcorrection was used alone and in the other it was paired with an extra-stimulus prompt, pictures.

METHOD

Subjects and Setting

Four moderately mentally retarded (on AAMD criteria) children participated in this study. All were pupils at a special school for mentally retarded children. Gina has Down's Syndrome, but the etiology of retardation of the other three subjects (Kerry, Gillian, Teresa) was not known. Kerry suffered from epilepsy and was on medication during the course of the study. Further information about the children is presented in Table 2. The study was conducted in

Insert Table 2 Here

a small room attached to the school hall. The children's classroom activities were carried out as usual but no instruction was provided in word recognition during the course of this study.

TABLE 2

Characteristics of the Subjects

Subject	Age (years)	Standford-Binet IQ	PPVT[a] (age equivalent in years)
Kerry	15	47	6.1
Gillian	9	38	2.11
Gina	14	40	4.9
Teresa	14	46	4.9
Mark	13	55	5.10

[a] Peabody Picture Vocabulary Test

Stimulus Materials

Three lists of five nouns were chosen for the present study. Each list was matched for word length and within the lists no more than two words had the same initial letter. The words were: List (1) -- feet, ladder, ambulance, zebra, and hedgehog; List (2) -- hook, thumb, vegetables, umbrella, and monkey; and List (3) -- hospital, fence, lion, letter, and astronaut. Each list of words was randomly assigned to one of the three experimental conditions: word and picture presented simultaneously (word/picture), word presented alone, and a control condition (where a word was presented alone but the overcorrection teaching technique was not used).

Each word was printed in lower case black letters (11mm high) on the right hand side of a 20cm by 12.6cm piece of white card. In the word/picture condition, a black and white picture of the word was pasted onto the left-hand size of the card. The left-hand side of the card was blank for the other two lists of words. This was to control for word position and size of card. For the posttest, each word was printed (in lower case black letters, 11mm high) in the middle of a 10cm by 15cm piece of white card.

Response Definitions

Two mutually exclusive responses were recorded: oral reading errors and correct responses to the printed word. An error was defined as any mismatch between the word and an oral response to that word, including mispronunciations. A response was recorded as correct when it matched the written word. Self-corrections were recorded as correct if the child accurately corrected an error without assistance

from the experimenter. Only the first attempt at self-correction was taken as a correct response and the self-correction had to be made before the experimenter moved on to the next word.

Data Collection and Reliability

The teacher who was the experimenter in this study had extensive experience in other studies on reading with mentally retarded persons (e.g., Singh & Singh, in press). She was given additional training prior to this study in implementing the experimental procedures used in the present experiment. Baseline recordings began only after the experimenter and an independent rater reached at least 95% agreement on response occurrences.

All experimental sessions were audiotaped and responses were rated from these recordings. An independent rater unobtrusively observed 20% of the experimental sessions to check that the experimenter correctly implemented the experimental procedures. On all such sessions the experimenter was observed to be following the correct procedures. For each child, 25% of the audiotaped experimental sessions were randomly selected and scored by an independent rater for inter-rater reliability checks. Inter-rater reliability, computed using a word-by-word analysis (Kazdin 1982) ranged from 98% to 100%, with an average agreement of 99.2% between the two raters.

Procedure

An alternating treatments design (Barlow & Hayes 1979) was used to compare the effects of two training conditions and

a no-training control condition. The three experimental conditions plus a posttest took no more than 15 minutes to complete each day for each child. A break of three minutes was scheduled between the experimental conditions and the posttest. Edible reinforcers (chocolate chippies) were provided contingent on correct responses in all conditions and phases of the study.

The study consisted of the following phases:

Baseline During each baseline session the subject was required to read all the words in the three lists, all presented without a picture. The subject was told: "Point to the word. What is that word?" The experimenter provided feedback on the accuracy of the child's responses but request for assistance with difficult words was ignored.

Alternating Treatments During this phase, the three experimental conditions were presented in a randomised order each day, and in addition, the order of presentation of the words within each list was randomised at the beginning of the session. During the word-alone condition, experimental sessions began with the experimenter telling the child: "I am going to show you some cards with words printed on them, and I want you to read each word as I show them to you." As each word was presented, the child was instructed to point to the word and then respond to the question: "What is that word?" In the picture/word condition and the word-alone condition the child was told, "Yes. That word is..." for a correct response, or "No. That word is ... Now point to the word and say ... five times". During the control condition, the child was reinforced for a correct response and all errors were ignored.

Posttest At the end of the three sessions the child was given a posttest, which in effect was a repeat of the baseline condition. The child was asked to point to and read the word. As in baseline, the child received feedback on the accuracy of his responses but all requests for help with difficult words were ignored. When a child correctly responded to the five words from one of the word-lists on three consecutive days the remediation phase was started.

Remediation In the final phase, the most effective of the three intervention conditions was used to teach all of the words. Training was terminated once a subject had responded to all the words correctly, on three consecutive days.

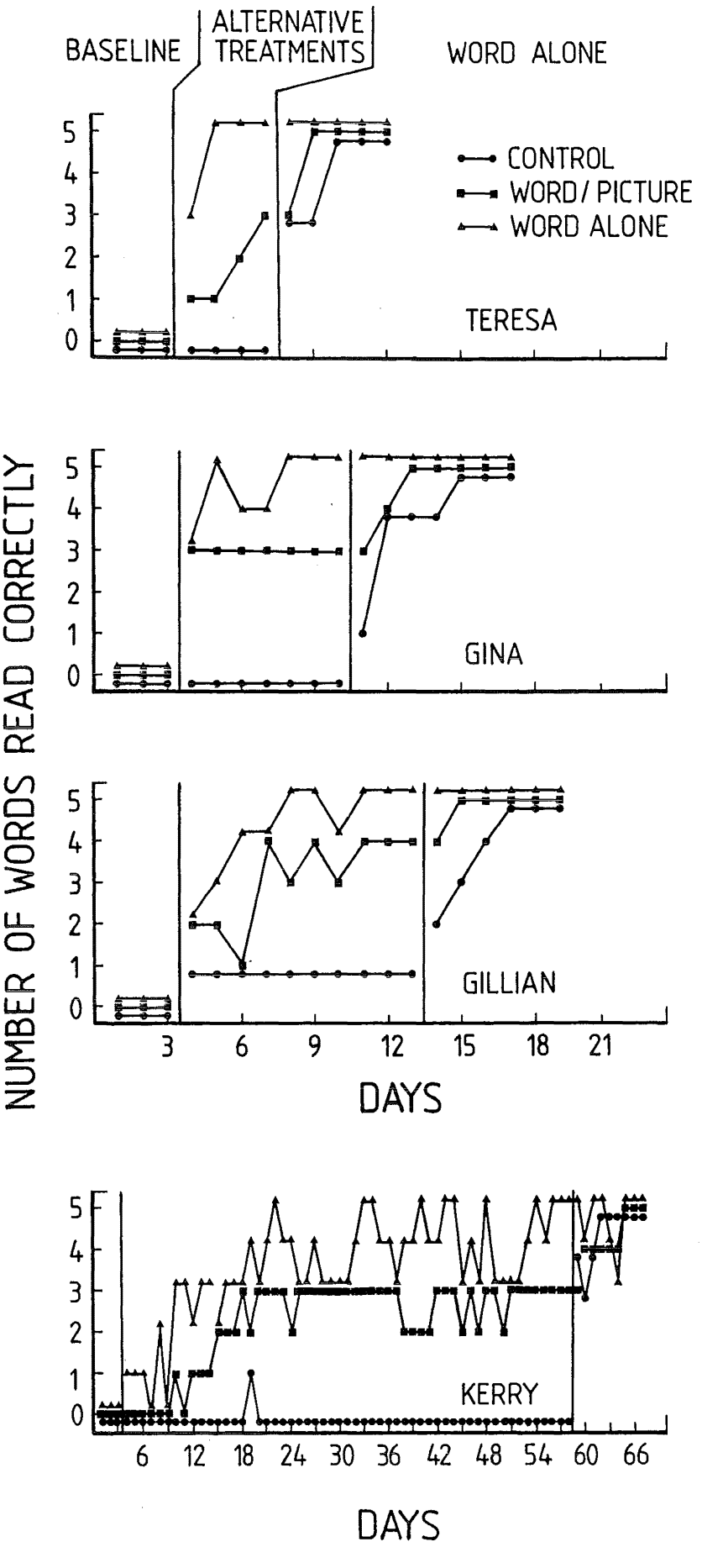
RESULTS

The number of correct responses for each individual for each of the three experimental conditions are shown in Figure 2. Data points during the intervention and the remediation phases are derived from the posttest sessions which were administered daily at the completion of the three training sessions. Table 3 shows the mean number of words answered correctly during all conditions and phases of the experiment across subjects.

Insert Figure 2 about Here

Figure 2 shows that the number of correct responses increased during the two training conditions (word/picture, word-alone). Although correct responses increased under

FIGURE 2. Number of correct responses for Gina, Teresa, Gillian, and Kerry across all experimental conditions. No intervention contingencies were in effect for the three groups of words during baseline. The word-alone, word/picture, and a no-training control condition were in effect during the alternating treatments phase. The most effective intervention procedure (word-alone) was in effect across all three word-lists in the final phase.


BASELINE
ALTERNATIVE TREATMENTS
WORD ALONE
CONTROL
WORD/ PICTURE
WORD ALONE
TERESA
GINA
GILLIAN
KERRY
NUMBER OF WORDS READ CORRECTLY
DAYS
DAYS

both intervention conditions, the word-alone condition was more effective for all children. For all subjects, the number of correct responses increased in the final phase when the most effective teaching condition (word-alone) was instituted with all three word lists. The subjects learnt one or no words in the control condition until the final phase.

Insert Table 3 about Here

Table 3 shows that during the training sessions, when pictures were present, the condition with the highest mean number of correct responses for all subjects was word/ picture. However, during the posttest, when no pictures were present, the highest mean number of correct responses for all the subjects was found with the word-alone condition.

DISCUSSION

With all four subjects in this experiment the word-alone method for teaching sight words produced the fastest learning to criterion. The children took varying numbers of training sessions to reach criterion on the word list with Kerry taking three times as many sessions as the other three children. However, even over this long training period the word-alone group of words was clearly learned faster. In the final phase, when the word-alone condition was in effect, it was interesting to note that this produced rapid learning of control words to criterion. This was especially obvious

TABLE 3

Mean number of correct responses across subjects and experimental conditions in Experiment 2

Experimental Conditions	Kerry			Gina			Gillian			Teresa		
	Word/ Picture	Word Alone	Con- trol	Word/ Picture	Word Alone	Con- trol	Word/ Picture	Word Alone	Con- trol	Word/ Picture	Word Alone	Con- trol
Baseline	0	0	0	0	0	0	0	0	0	0	0	0
Alternating treatments Training Sessions	4.8	3.5	0	5	3.8	0	4.2	3.5	1	4.2	3.7	0
Alternating treatments Post test	2.2	3.8	0.02	3.0	4.4	0	3.1	4.2	1	1.7	4.5	0
Remediation Training sessions	3.5	4.4	3.8	3.8	5	2.8	4.7	7.5	3.2	3.6	5	3
Remediation Post test	4.2	4.5	4.5	4.5	5	4	4.8	5	3.8	4.6	5	4.2

in Kerry's case who learned the five control words in only nine sessions.

During the training trials, when pictures were present, each subject gave significantly more correct responses during the word/picture condition than during the word-alone condition. It would seem that the children used the picture as a cue for their oral response instead of the word. That is, the children attended mainly to the picture making it more difficult to learn the word. During the posttest, when pictures were not available as cues, the subjects gave significantly more correct responses to the word-alone list of words. Since the children had only the word as a cue in the word-alone condition, their attention was focused on the word, thus enabling them to learn the word more rapidly. In sum, the results of the present experiment indicate that the use of picture prompts did not enhance word recognition skills but that, in this group of mentally retarded children, the use of pictures as prompts in teaching word recognition distracted their attention away from the printed word, making it more difficult to be learned.

EXPERIMENT 3

EFFECTS OF EXTRA-STIMULUS PROMPTS: OBJECTS VS NO OBJECTS

In Experiment 2, it was found that the use of a picture as an extra-stimulus prompt did not enhance the learning of a list of sight words. The children learned more rapidly a list of words that were presented without a picture. It appeared that the pictures acted as distractors, drawing the child's attention away from the printed word. Experiment 3 further explored the effects of extra-stimulus prompts on the learning of sight words by moderately mentally retarded children. In this experiment, objects instead of pictures of the words were used as prompts. As in Experiment 2, an overcorrection procedure was used as the teaching technique.

METHOD

Subjects and Setting

Three of the subjects from Experiment 1 (Gillian, Gina, Teresa) participated in this study. An additional subject, Mark (see Experiment 2, Table 2), also participated. Mark was moderately mentally retarded (on AAMD) and was a pupil at the same special school as the other subjects. The etiology of Mark's mental retardation was not known and he did not suffer from epilepsy. He was not on any medication during the course of the study. The study was conducted in the same setting as in Experiment 2.

Stimulus Materials

In this study, three lists of five nouns were chosen. As in Experiment 2, each list was matched for word length and within the lists no more than two words had the same initial letter. Each list was randomly assigned to one of the three experimental conditions: word plus objects presented simultaneously (word/object), word presented alone (word-alone), and the control condition (word presented alone and no teaching was scheduled).

All words were printed on the right hand side of a 20cm by 12.5cm piece of white card in lower case black letters (11mm high). The word/object list consisted of the following words: ribbon, mirror, chocolate, button and daffodil. The word-alone list contained: wheelbarrow, banana, needle, magazine, and jersey; and, the control list of words consisted of: trousers, shampoo, blackboard, scissors, and bucket. In the word/object condition the object was glued to the left-hand side of the card. The ribbon was a 30cm black ribbon of the kind that may be worn in a girl's hair; the mirror was a small (5cm by 7cm) plastic-backed child's mirror; the chocolate was a small cake of chocolate in it's original wrapping; the button was from a coat (blue and about the size of a twenty-cent piece), and an actual daffodil was used for the daffodil. The left-hand side of the card was left blank in the other two lists of words to control for word position. For the posttest, all fifteen words were printed (in lower case black letters, 11mm high) in the middle of a 10cm by 15cm piece of white card.

Response Definitions

The same response definitions were used in this experiment as in Experiment 2. An error was defined as any mismatch between the printed word and an oral response to that word, including mispronunciations. A response was recorded as correct when the oral response matched the printed word. Self-corrections were also recorded as correct if the child accurately corrected an error without assistance from the experimenter. Only the first attempt at a self-correction was taken as a correct response and this had to be made before the experimenter moved on to the next word.

Data Collection and Reliability

The same experimenter and data collection procedure were used as in Experiment 2. As in Experiment 2, 25% of the audiotaped experimental sessions were scored by an independent rater. Inter-rater reliability, computed using a word-by-word analysis (Kazdin 1982) ranged from 98% to 100%, with an average agreement of 99.5% between the two raters.

Procedure

Exactly the same experimental procedure was utilised here as was used in Experiment 2. The only difference between the experiments being that objects were used instead of pictures.

RESULTS

The number of correct responses made by each child are shown in Figure 3. Data points are from each posttest

session in all phases of the experiment. The word alone method was used during the remediation phase as it was found to be the more effective procedure in the alternating treatments phase.

Insert Figure 3 Here

Figure 3 shows that during baseline there were no correct responses made by any of the children. During the alternating treatments phase, correct responses increased for each child under both experimental conditions. No correct responses were made in the control condition. The greatest increase in correct responses for all children occurred in the word-alone condition. In the final phase when the more effective condition (word-alone) was used for all three word lists, correct responses increased across the three groups of words.

Insert Table 4 Here

As shown in Table 4, during the training sessions, the highest mean number of correct responses was obtained in the word/object condition by all children. However, during the posttest sessions, when the objects were not present, the children had a higher mean number of correct responses under the word-alone condition.

FIGURE 3. Number of correct responses for Gina, Teresa, Gillian, and Mark across all experimental conditions. No intervention contingencies were in effect for the three groups of words during baseline. The word-alone, word/object and a no-training control condition were in effect during the alternating treatments phase. The most effective intervention procedure (word-alone) was in effect in the final phase.

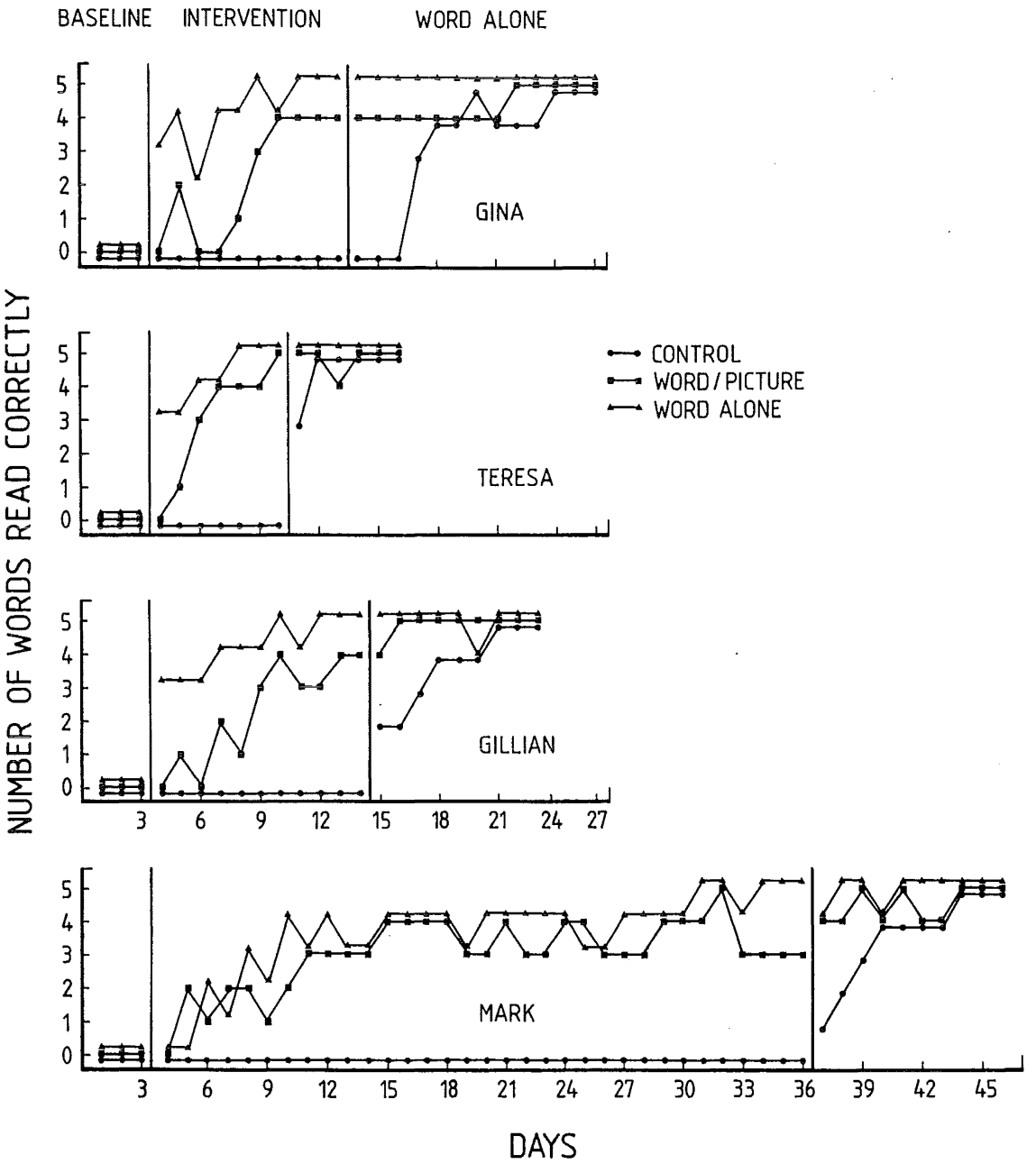

BASELINE
INTERVENTION
WORD ALONE
GINA
TERESA
GILLIAN
MARK
CONTROL
WORD / PICTURE
WORD ALONE
NUMBER OF WORDS READ CORRECTLY
DAYS

TABLE 4

Mean number of correct responses across subjects and experimental conditions in Experiment 3

	Mark			Gina			Gillian			Teresa		
Experimental Condition	Word-Object	Word-Alone	Control	Word-Object	Word-Alone	Control	Word-Object	Word-Alone	Control	Word-Object	Word-Alone	Control
Baseline	0	0	0	0	0	0	0	0	0	0	0	0
Training Sessions	3.5	3.3	0	4.8	3.2	0	3.9	3.3	0	4.7	3.2	0
Training Sessions post test	3.0	3.4	0	2.2	4.1	0	2.2	4.1	0	2.6	3.6	0
Remediation training sessions	4.3	4.7	3.0	4.3	5	3.4	4.3	4.8	2.7	4.8	5	3.3
Remediation post test	4.5	4.8	3.7	4.3	5.0	3.6	4.8	4.8	3.7	4.8	5	4.6

DISCUSSION

From the results of this experiment it is clear that children tend to make fewer errors when taught words without the aid of an object as a prompt. All of the children learned the words more rapidly when taught using a word-alone method. This finding is in agreement with Experiment 2, where it was found that mentally retarded children learned a list of sight words more quickly without the aid of a picture prompt.

GENERAL DISCUSSION

This study initially looked at whether a behavioural technique, overcorrection, could be used to teach basic sight words to moderately mentally retarded children. The overcorrection procedure involved asking the child to say a word five times when it had been read incorrectly. In addition, reinforcement was provided for correct responses. The present study then investigated the effects of two types of prompts (pictures and objects) on word acquisition. This was to see whether the use of prompts in conjunction with an overcorrection procedure as a teaching technique would further enhance word recognition skills. A simple picture portraying the word or an object of the word were presented simultaneously with the word to be learned. These two prompting or cueing conditions were compared to a word-alone condition.

The present study showed that overcorrection is an effective method for teaching basic sight words to mentally retarded children. The results from Experiment 1 are clear in that while no children learned any of the words during a no-training baseline condition, all ten words were learned once intervention with overcorrection was initiated. This finding was consistent across all subjects. These results are in accord with recent studies which have found overcorrection to be effective with mentally retarded children in increasing their spelling achievement (Matson, et al. 1982; Stewart & Singh, in press), increasing reading proficiency (Singh & Singh, in press; Singh et al. 1984), and in the acquisition of sign language (Linton & Singh 1984).

Overcorrection is a teaching technique which has advantages over more traditional teaching procedures typically used by teachers. It is educative in that a student is provided with opportunities to learn a correct response rather than merely to receive punishment for incorrect responding. Also, the student is not treated as a person who is a school failure but as a person who needs more training in an area. The procedure is simple yet effective for classroom use and is, thus, acceptable to teachers.

As far as the use of extra-stimulus prompts (pictures or objects) to aid acquisition of basic sight words is concerned, the data from Experiments 2 and 3 indicate that moderately mentally retarded children learn sight words more quickly when unaided by these prompts. The results are clear in that, when considered individually, all children in both experiments learned the sight words faster when prompts were not present. This is a highly significant finding given the differing ages, reading level, and sex of the subjects. Despite the sample population being small, it would be realistically expected that these results can be generalised to the broader population of moderately mentally retarded children because of the robust experimental methodology employed in these studies. However, since the present study is the only one to have investigated the effects of over-correction and extra-stimulus prompts on word recognition in mentally retarded children, replications of this study would be advisable. Generalisability of the present findings would be strengthened if replications are carried out with children with various levels of retardation.

The results of Experiments 2 and 3 can be discussed with respect to other relevant investigations although comparisons are hindered by the lack of research using a mentally retarded population and single-subject designs. Only one other study (Smeets, et al. 1984) investigated the effects of prompts on word acquisition with mentally retarded persons. They found the efficacy of pictorial prompts to be uniformly low when no fading was used and concluded that external prompts such as pictures should only be used as long as they guide the subjects attention to the training stimulus. Although this and the present study are somewhat different methodologically, both studies, however, support the notion that prompts such as pictures do not aid word recognition skills in mentally retarded students.

Inherent differences between the present study and other research in the area are recognised. The present study used a group of moderately mentally retarded children as subjects while most other studies have used children of "average" intelligence. The present study used an overcorrection procedure as the teaching technique while other studies have invariably used a more traditional 'show and tell' or trial-and-error teaching technique. This study utilised a single-subject design while other studies in the area have used a group design. However, while there are recognised inherent differences between the present study and other research in the area, a comparison of results is still considered useful.

Samuels (1967) found that kindergarten children learnt sight words faster when the words are presented alone than

with a simple or complex picture portraying the word. Thus the above investigation and the present study both found pictorial prompts to hinder word acquisition. Samuels (1967) uses an attentional explanation to account for the adverse effect picture prompts have on word recognition skills. An attentional explanation states that extra-stimulus prompts function as distracting stimuli in that they draw attention away from the printed word. The word is thus learned more slowly in the presence of distractors. Wilhelm and Lovaas (1976) advance a similar explanation, suggesting that mentally retarded children may respond to only a few cues from the large range available. Thus, in terms of reading the mentally retarded child may have some difficulty with prompts since he may attend only to the prompt and not the training stimulus. These explanations may well apply in the present study as well although this is an empirical question and needs to be experimentally evaluated.

The present study also reports findings consistent with that of Braun (1969), Harzem, et al. (1976) and Harris (1967) who all reported that children learn sight words significantly faster when the words are presented alone rather than with a picture.

Ollila and Olson (1972) found a sex difference in word acquisition. They found that, for girls, it made little difference to word acquisition whether the words were presented alone or with a picture or an object. With the boys, the word-alone method produced the most rapid learning. Braun (1969) also found that word discrimination is facilitated to a greater degree for boys in the absence of pictorial cues

than is the case for girls. No such sex difference was found in the present study.

A number of studies (e.g., King & Muehl 1965; Kiraly & Furlong 1974) have shown that words are learned just as easily or more easily with the aid of a picture prompt. These studies have generally differed from the present study in that attention has been drawn to the printed word during training sessions by a verbal instruction to look carefully at the word while the picture is covered or to connect the word to the prompt with a line.

Smeets et al. (1984) found that in a group of mentally retarded children external cues such as pictures can be used effectively in word acquisition as long as the child's attention is guided to the training stimulus. The procedure used in the present study did not guide the subject's attention to the printed word by covering the picture at any stage or verbally stating the importance of looking closely at the word. This procedure detail may account for the conflicting results between the present study and some of the studies discussed above. A replication of the present study with the addition of a procedure to draw the subject's attention to the printed word would be valuable. For example, the child can be told to look closely at the word, and the picture can be covered for a short period while the child looks at the word. And then, this can be compared to a word-alone condition.

Only one study was found which assessed the effects of object prompts on word acquisition, and this study was conducted with children of "average" intelligence (Ollila & Olson 1972). No research has been conducted with mentally

retarded students which examined the effects of object prompts on word recognition skills. Ollila and Olson (1972) investigated the effectiveness of three different methods of presenting new words to kindergarten children. The children were taught using either a word-alone, word-picture, or word-object method. For girls, it made little difference whether the words were presented alone or with a picture or object. Significant differences were found for boys, with the word-alone method of presentation producing the most efficient learning followed by word-picture and word-object methods.

The present study found that for both boys and girls the word-object condition produced the least efficient learning rate with the word-alone condition producing the most efficient learning rate. The obvious lack of research on the effects of object prompts on word recognition skills makes it difficult to generalise the results of Ollila & Olson (1972) and the present studies to the mentally retarded student. However, the present study clearly showed that object prompts hinder word acquisition in moderately mentally retarded students. A replication of the present study with other mentally retarded children would add strength to this finding.

This study's finding that extra-stimulus prompts such as pictures and objects hinder word acquisition in mentally retarded children is particularly important in view of the finding (Dunn 1954) that mentally retarded children tend to read below mental age expectation. It should be noted that all subjects in the present study were reading below their mental age expectancy level. All children learned a list of

either ten or fifteen words during the course of the study which would suggest that these children are quite capable of learning a sight word vocabulary. The children were also willing and enthusiastic during the training sessions and showed obvious pride that they had learned the whole word list. For example, at the completion of Experiment 1, Kerry asked to take his word cards home with him so that he could show his parents.

In the classroom, most basal readers involve pairing a sight word with a picture or an object of that word. From the evidence cited and presented in this study it would seem that this practice merely serves to hinder the child's learning.

A number of studies, with children of "average" intelligence, have shown extra-stimulus prompts such as pictures to adversely affect the performance of the less capable student (Baker & Madell 1965; Samuels 1967). It would seem likely, therefore, that the mentally retarded child will find it difficult to acquire word recognition skills if extra-stimulus prompts are used as part of the teaching programme as they so often are used in the classroom.

For a number of ethical and practical reasons it is important that researchers determine the efficacy of different methods of teaching reading to mentally retarded students. It is also important that out of this research appropriate programmes are developed for teaching word acquisition and reading skills to mentally retarded children. These children, like any other, have the right to be able to develop adequate reading skills. It is important that they are reading at least at mental age expectancy levels if they are to take

their proper place in the community.

In addition, it is important that teaching programmes are adopted for use within the regular and special classroom. Teachers must be educated as to the effect that picture and object prompts have on word acquisition in the mentally retarded child. Ollila and Olson (1972) asked teachers, prior to their study, which technique would be the most efficient method of teaching basic sight words: a word-alone method, a word-picture method, or a word-object method. The word-object method was chosen unanimously by the teachers. As shown by Ollila and Olson (1972) and in the present study, this method is not the most appropriate one to use. Thus, it appears that teachers must be trained and encouraged to use the findings from such research in their teaching.

The present findings suggest that moderately mentally retarded children can be rapidly taught a basic sight word vocabulary using the overcorrection procedure outlined in Experiment 1. This does not involve the presentation of any prompts such as pictures or objects. The procedure is also easily taught to teachers and easily administered to students. An overcorrection technique should be acceptable to educators as it creates a minimum of classroom disruption and involves little teacher time.

Singh and Singh (1985) comment that the research in the area of reading with mentally retarded persons is fragmentary and without a conceptual focus. If adequate teaching programmes are to be developed future research will need to utilise methodologically robust experimental designs, adequate sample sizes, and replication and follow-up studies.

Future research could be directed at a number of issues. While the present study looked at the effects of prompts on learning basic sight words that are dissimilar the issue of whether prompts aid teaching sight words that are similar (e.g., car, cot) to mentally retarded children would be useful. Using a population of kindergarten children, King and Muehl (1965) found that pictures had neither a positive or a negative effect on word recognition when the words to be learned were dissimilar and that pictures were an aid when the words to be learned were similar. Because of the type of prompts (pictures and objects) used in this study only nouns were taught to the children. Other procedures such as teaching sight words in a sentence or story context could also be investigated. Hartley (1965) found that for dissimilar words, an oral sentence cue was more effective than a picture cue or the word-alone in teaching sight words to first grade students. It would be instructive to replicate this study using a population of mentally retarded children.

Arlin et al. (1978) suggested that certain confounding variables may account for the conflicting results found in many studies in the area of reading research. The present study did not control for some of these variables such as the medium of presentation, voice feedback or for the temporal order of cueing. Arlin et al. (1978) conducted a study with kindergarten children which attempted to control for these confounding variables. Their data indicated that the simultaneous presentation of pictures with concrete sight words facilitates rather than hinders learning. However, the design of the present studies would suggest that these variables may not be as important as perhaps in studies using

group designs.

The question of experimenter bias can also be raised as an uncontrolled variable in a study such as this. Because the experimenter knew which words were being taught under different conditions in Experiments 2 and 3, a bias may have been operating. The experimenter was asked which condition she thought would show the most efficient learning. She stated that it would be the word-picture method in Experiment 2 and the word-object method in Experiment 3. She was not told which method was expected to have the greatest efficacy. If an experimenter bias was operating it would, therefore, have been in the opposite direction than the results showed.

The present study has a number of merits. Firstly, this study utilised a single subject alternating treatments design which permits a direct comparison of two or more interventions with each subject. Previous research in this area has invariably used a group design. This study is the first to investigate the effect that object prompts have on word recognition in mentally retarded children. Only one other study (Smeets et al. 1984) has investigated the effects of picture prompts on word recognition in this population. This study, then, has contributed directly to the area of reading research with mentally retarded persons. The results of this study can be translated into training programmes for classroom use and, finally, it challenges the common assumption that extra-stimulus prompts aid word recognition in mentally retarded children.

In conclusion, the present study showed that over-correction is a useful technique for teaching reading to

mentally retarded children and that the use of extra-stimulus prompts, such as pictures and objects, do not enhance word acquisition in mentally retarded children. Although much more research is needed in this area, these findings have important implications for instructional programmes for mentally retarded children.

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